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ABSTRACT

This report outlines a method for analyzing the status of stimuli which control deviant child behavior. Hypothetically, an effective family treatment program would not only alter the reinforcing contingencies provided by family members for the deviant behaviors of the problem child, but would also reduce the frequency with which they present these behaviors which signify the availability of reinforcers. The data in this study, extensive samplings of sequential interactions found among family members, were collected in the home of an extremely disruptive boy. The analyses of these data were then used to illustrate shifts in stimulus control produced by a family intervention program; the data showed the parents to be only moderately effective in reducing the rate of deviant child behaviors for their problem child. However, there were changes from baseline through follow-up in the number of social behaviors which served as controlling stimuli for noxious behaviors; and, as treatment progressed, those stimuli which did significantly control deviant behaviors were also presented at lower densities. Presumably, these changes were largely the result of the parents' success in altering behaviors of the younger sister which had provoked deviant responses from the problem child. Findings suggest that analysis of stimulus control may constitute a subtle description of changes in family structure. (Author/SES)

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Changes in Status of Family Members as Controlling Stimuli: A Basis for Describing Treatment Process

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Changes in Status of Family Members as Controlling Stimuli: A Basis for Describing Treatment Process[1]

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Paper presented at the Fourth Banff International Conference on Behavior Modification, March 1972. In F. W. Clark & L. Hamerlynck (Eds.) Critical Issues in Research and Practice. Champaign, Ill.: Research Press, 1972, in press.

Both individual case studies (Wolf, Mees, & Risley, 1965; Zeilberger, Sampen, & Sloane, 1968) and those involving larger samples (Wahler & Erickson, 1969; Patterson, Ray, & Shaw, 1968; Tharp & Wetzel, 1969; Patterson, Cobb, & Ray, 1972b) showed that parents can be trained to effectively apply social learning principles to alter the behavior of their own problem child. Presumably these changes are brought about by changes in the reinforcing contingencies provided for the problem child's deviant behavior. When the child displays a deviant response, the parent is trained to either introduce an extinction or a punishment contingency. It is hypothesized that consistent arrangements of this kind would result in eventual changes in the status of certain agents and agent behaviors as discriminative stimuli for deviant child behaviors.

It was demonstrated in previous analyses that there were specific things which family members did that increased the probability that the problem child would respond in a deviant manner (Patterson & Cobb, 1972a; 1972b). These analyses showed that, for the younger boy, immediately impinging social stimuli apparently determine much of his on-going social behaviors. While no analyses of sequential dependencies found in social interactions have identified the mechanisms which provide some social stimuli with such control features, it is assumed that reinforcement would be one important contributor.

Within this context, it is assumed that certain behaviors when dispensed by a family member are also associated with rich schedules of positive or negative reinforcers for specific deviant child behaviors. In effect, the behavior of the agent signifies which deviant child behavior, if any, is likely to be reinforced at that time. Some agents reinforce such behaviors on very lean schedules, or not at all, and the child learns not to display such behaviors in the presence of that agent. By and large, each family agent tends to reinforce at least a few deviant responses; and certain of his behaviors signal when it is likely that such a reinforcer will occur. Presumably an effective family treatment program would not only alter the reinforcing contingencies provided by family members for the deviant behaviors of the problem child but reduce the frequency with which they present these behaviors which signify the availability of reinforcers.

The present report outlines a method for analyzing the status of stimuli which control deviant child behaviors. The data requisite for such an analysis are extensive samplings of sequential interactions such as those found among family members. The procedures have been used previously to identify networks of social stimuli which controlled classes of noxious responses exhibited by aggressive and normal boys (Patterson & Cobb, 1972). In the present study, pre- and posttreatment data were collected in the home of an extremely disruptive boy. The analyses of these data were used to illustrate shifts in stimulus control produced by a family intervention program.

Analysis of Stimulus Control

Given sequential data collected along some known time base, one can proceed in the manner of ecologists (Barker, Gump, Campbell, Barker, Willems, Friesen, LeCompet, & Mikesell, 1962), by specifying the frequencies with which certain events precede, or covary with, certain behaviors. However, such simple frequency counts do not necessarily identify controlling stimuli.

For example, given that a certain setting such as "school" takes up two-thirds of the observations, it is exceedingly likely to be identified as a major antecedent for any given target behavior (R_j) being studied.

The definition of "controlling stimulus" used in the present report and the series of across-subject analyses which preceded it (Patterson & Cobb, 1972a; 1972b) requires that occurrence of the antecedent stimulus be associated with an increase in the probability of the target response. In this sense, then, a frequent antecedent may or may not be a "controlling stimulus." To determine the status of a stimulus, it is necessary first to tabulate its occurrence as an immediate antecedent (A_i) for all non-target behaviors as well as its occurrence as antecedent for the target behavior. Comparing the latter probabilities for $\underline{p}(R_j/A_i)$ to $\underline{p}(R_j/\text{Non-}A_i)$ makes it possible to discriminate between events which are simply antecedents and those which control behavioral events. For example, given that Sister Tease occurred as an immediate antecedent for Brother's Hit on ten occasions and the total sample of Sister Tease events was 30, then $\underline{p}(R_j/\text{Sister Tease}) = .30$. Comparing this figure to the base rates for R_j given all other antecedents provides the specific base for making the decision about stimulus control. Given that $\underline{p}(R_j/\text{All Non-Sister Tease})$ was .002, then one would conclude that Sister Tease was a controlling stimulus.

In the present report, the time interval used for the collecting of observations was six seconds (Patterson, Ray, Shaw, & Cobb, 1969); hence the problem involved predicting what would happen from one six-second interval to another. Subject and environmental events were arranged sequentially in six-second intervals along a time line. Antecedent events were analyzed to determine their contribution to increasing the probability that R_j would occur in the immediately following time interval. Those which significantly increased the probability that R_j would occur were labeled "facilitating stimuli" (S^F).

An S^F could occur as a function of its association with reinforcement, repeated contiguous association, and cognitive or instinctual processes. It was hypothesized that the S^Fs controlling deviant behavior would be altered as a function of treatment.

Present Study

A 29-category code system was used to collect 48 baseline observation sessions, eight during and two following intervention. The data were collected as part of the evaluation for treatment of a family of a high-rate aggressive boy.

The baseline data were analyzed twice to determine the networks of stimuli controlling each of 14 noxious behaviors. The first analyses identified those family members whose presence served as facilitating stimuli (S^F) for each of the noxious behaviors displayed by Denny, the aggressive boy. A second analysis was carried out to identify those behaviors (across agents) which served as S^Fs for each of the noxious behaviors.

During treatment the parents were trained to alter the reinforcing contingencies for certain deviant and prosocial behavior displayed by the problem child and by his sister. These intrusions were designed to reduce rates of the deviant child behaviors. It was assumed that they would also alter the status of both the parents and the sister as S^Fs for noxious behaviors displayed by the boy. These changes in stimulus control should be reflected in two ways: (1) First there should be a decrease in the density with which family members present these S^Fs to Denny and (2) there should be a reduction in the magnitude of control exerted by those S^Fs which were presented.

Procedures

The Target Child

Denny was referred to the Project by his parents, who in turn had been urged to do so by the school. This six-and-a-half year old boy was

reported to be unmanageable in the first grade classroom. In addition to frequent temper tantrums which involved his throwing objects about the room, he was disruptive to other children. He seldom responded to requests by the teachers and was making little progress in his academic subjects. He performed at the 16th percentile or less on the Wide Range Achievement Test for reading, spelling, and arithmetic.

His father reported that he was impossible to live with at home. His noncompliance, temper tantrums, teasing, hyperactivity, and constant conflict with family members was making life miserable for his mother and his three-year-old sister. He tended to yell at a very high rate; his normal inflection was an irritating nasal whine. Often he would wander away from home for hours; such excursions would be followed by complaints of his stealing from stores and neighbors. Currently, Denny was being treated by 10 mg. b.i.d. of Ritalin, but it seemed to have only minimal behavioral effects.

The father was taking a course as an auto mechanic; the mother worked in a local factory. They lived in a modest but well-appointed home. When Denny returned from school, he was to go to a neighbor's home where he was "supervised" until one of his parents returned later in the afternoon.

The father was a mild-mannered, cooperative man, 29 years old. He seemed genuinely concerned about his family and eager to begin the training program. He described himself as warm and permissive in his interactions with Denny. His MMPI profile was '4379518 - 3:2:17. The mother was a silent, timid, withdrawn woman, 27 years of age. Her MMPI profile was '0398714 - 4:3:15. She seemed very confused by Denny's behavior and reported often feeling very angry. She was taking tranquilizers for her "tension."

Observations

Denny and his family were observed in their home for 12 days of baseline. Each day three sessions of approximately 60 minutes' duration were arranged

for. One was held 7:00 to 8:00 in the morning, one at 2:15 to 3:15 in the afternoon, and a third at 4:00 to 5:00 in the evening. During these three sessions, Denny was the "target subject" for the entire period. Each day there was also a fourth session, at 3:15 to 4:00. For this each family member was the target subject for two five-minute segments. During the latter session all family members were required to be present, the TV set turned off, and no guests present. None of these structuring requirements was introduced for the three earlier sessions each day.

During intervention, eight days of observation data were collected; two consecutive sessions occurred immediately following the parents' reading of the programmed textbook at four and eight weeks of training, and at termination. While the case was not deemed ready for termination, it became a necessity when the parents decided to move to another city where the father had obtained employment. Two weeks following termination, the parents kindly allowed the observers to collect two additional days of observation data.

The observers received intensive training in using a 29-category coding system (Patterson, Ray, Shaw, & Cobb, 1969) which was designed specifically to describe aggressive behaviors and the stimuli which control them. Approximately every sixth second, the observer sampled either the behavior of the target subject, or the behavior of whichever family member(s) was interacting with him. The data offer a continuous sequential account of these interactions.

Observer drift: Research by Reid (1970) has demonstrated that observers showed an immediate drop in reliability following training when placed in a situation which they believe to be unmonitored. For this reason, bi-weekly training sessions were held in which the five observers viewed videotapes of very complex interactions among members of deviant families. A recent report by DeMasters and Reid (1972, in preparation) showed this procedure to be effective in ameliorating the "observer drift" phenomenon.

The continuous retraining has also led to very high levels of agreement among the observers. The average agreement among observers was 85% during the period covered in the present report. Events had to be coded correctly by subject number, coding category, and in the proper sequence to count as an agreement. Percent agreement was the proportion of the total number of events recorded by either observer for which they were in agreement divided by the sum of the total number of events noted by both observers.

Observer bias: The importance of observer bias has been noted by Rosenthal (1966); Scott, Burton, and Yarrow (1967) showed that the therapist was biased in observation of the behaviors of his client. However, in the present project, a comparable effect was not obtained by Skindrud (1972a), who analyzed the field observations from 16 problem and 10 non-problem families. The professional observers had knowledge of which families were problem and which were not, and also whether the sessions were in the baseline period or in the treatment period for the problem families. Their data were compared to that obtained by calibrating observers who had none of this information. The analysis showed no bias toward recording higher rates of deviancy in problem families or in recording lower rates during treatment. Similarly, more carefully controlled laboratory studies by Skindrud (1972b) showed no bias as a function of instructional set or information.

Observer presence effects: Presumably, the observers' presence functions as a social stimulus which has some impact upon the family interaction; however, the nature and magnitude of this effect has proved difficult to determine. Two studies compared family interaction patterns obtained when mothers surreptitiously observed their own families to data obtained when observers came into the home. There were no significant effects of observers' presence detected, either for rates of social interaction (Harris, 1969; Hoover & Rinehart, 1968) or for rates of deviant child behaviors (Patterson

& Harris, 1968). However, it should be noted that the size of the samples and the variability inherent in the data would have mitigated against identifying anything other than very large effects. The Harris analysis did reveal, however, that the observers' presence was associated with greater unpredictability in the behavior of family members (Harris, 1969).

In a study by Johnson and Lobitz (1972) parents were given instructions to "make their child look good" or "make their child look bad" on alternate nights of observation. The data for child behavior showed marked shifts as a function of this instructional set. This suggests the possibility that observer presence could produce variations in the set which the parents have to make their family look good or look bad.

Stimulus Control Analysis

For the current analysis, noxious behaviors exhibited by boys between the ages of three and 14 were identified. These included: Command Negative (CN), Cry (CR), Disapproval (DI), Dependency (DP), Destructiveness (DS), High Rate (HR), Humiliate (HU), Ignore (IG), Noncomply (NC), Negativism (NE), Physical Negative (PN), Tease (TE), Whine (WH), and Yell (YE).

Dependent variable: The dependent variable used throughout the analysis was the probability of occurrence for a given noxious response. The base rate value $p(R_j)$ was calculated for each of the 14 responses; this was calculated by tabulating the total number of events that Denny exhibited and dividing this sum into each of the summed R_js. Only those noxious behaviors exhibited by Denny were included where the same family member was coded as providing both the antecedent and consequence for the behavior.

Facilitating stimuli: Each of the 29 categories displayed for other family members was analyzed to determine the frequency with which they occurred as antecedents for Denny's behaviors (excluding his non-social responses Work, Self-Stimulation, and No Response). Then the conditional

probability $p(R_j/A_i)$ was calculated based upon the frequency with which each of the events occurred as an antecedent for each of the 14 noxious behaviors. For purposes of comparison, the contribution of an event as an antecedent for R_j was subtracted when calculating $p(R_j)$ providing a corrected base rate value. The decision about controlling stimulus involved a comparison of the corrected base rate value to the conditional probability value. To facilitate this decision process, a chi-square analysis was used. When appropriate, corrections were made for continuity or, if the Ns were small, Fisher's exact chi-square was used.[2] Those antecedents which produced conditional probability values greater than the base rate values and for which the chi-square values were significant at $p < .10$ were said to be S^Fs (significant controlling stimuli).

Even though identified as significant, an S^F's contribution to prediction might be trivial. For example, given that a significant stimulus occurred very infrequently, then the contribution of such an antecedent might be severely limited. For this reason, the information contained in the conditional probability of R_j given the presence of the antecedent stimulus $p(R_j/\text{Antecedent}_i)$ was combined with the information about the base rate for the S^F. Summing the compound probabilities resulting from multiplying $[p(R_j/\text{Antecedent}_i)]$ $[p(\text{Antecedent}_i)]$ for each of the code categories would account for all of the information available for $p(R_j)$, i.e., sum to 1.00.

Controlling stimuli, then, may have two characteristics. They may be "significant" or "nonsignificant" as S^Fs, and their compound probabilities may be of different magnitudes. It is important to keep in mind that the two characteristics were not necessarily related. An antecedent stimulus that occurred only once but was followed by a Hit would generate a conditional probability $[p(\text{Hit}/\text{Antecedent}_i)]$ of 1.00. The chi-square analysis would identify such a variable as nonsignificant. Similarly, the compound probability

$[p(\text{Hit/Antecedent}_i)][p(\text{Antecedent}_i)]$ would be extremely low and thus either process would identify such a variable as of limited value. While all high rate antecedents are likely to have relatively high compound probability values, the chi-square analyses may or may not prove them to be significant. Therefore, a two-step process was used to determine controlling stimuli. Both steps were a necessary, but neither was a sufficient, condition for defining an antecedent variable.

Intervention

Most of the family training procedures used to teach Denny's parents have been described in previous publications (Patterson, Cobb, & Ray, 1972b). The parents were required to read programmed materials outlining social learning materials outlined in Families (Patterson, 1971). Then they were trained by videotapes of their own family to pinpoint, observe, and tabulate the occurrence of a target behavior, for example, Yell. When the parents had collected several days of baseline data, a program was initiated which consequated non-yelling behaviors with social reinforcement and a point system, while at the same time consequating Yell with Time Out. The skills required to carry out this, and the other programs, were modeled and supervised by the experimenters. When the parents had made considerable progress in bringing Denny's behavior under control at home, they "earned" the additional therapists' time required to intervene in the classroom. These classroom procedures have been described in the monograph by Patterson, Shaw, and Ebner (1969) and in Patterson, Cobb, and Ray (1972a).

The total investment of therapist time for the home and school intervention was 94.7 hours. This included intake interview, telephone calls, travel time, and all contacts with family members or school personnel. When two staff members were in attendance, the time for both was included in the estimate.

Results

The baseline, intervention, and follow-up data were analyzed to determine which of Denny's deviant behaviors, if any, showed changes following interventio. The data, expressed as rate per minute, were calculated for each of the three phases of the study. The intervention data sampled were entire period rather than just the termination probe. Also included were data from parents' daily reports of occurrence of problems identified as being of concern to the parents. These data were obtained on each day that observations were collected in the home.

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Insert Table 1 about here

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Comparing the baseline and intervention data showed a modest reduction in overall level of deviant behaviors. The reductions occurred for 10 of the R_js. At follow-up there was an overall reduction of about 50% from baseline level; these reductions obtained for 11 of the 14 problem behaviors. These modest changes served as the basis for examining concomitant changes in status as controlling stimuli.

Analysis of Stimulus Control

The baseline data were analyzed for each of the 14 noxious responses (R_js) to identify the network of stimuli controlling the behaviors. Those facilitating stimuli (S^Fs) found to be significant for each R_j were listed in Appendix A, together with their base rates, conditional probability values, and compound probabilities.

As summarized in Table 2, each of the noxious responses was defined by at least one facilitating stimulus. Several, such as Whine, Disapproval, Cry, and Command Negative, were defined by extensive networks of four and five stimuli.[3] The information about the extent to which the controlling stimuli

accounted for a specific R_j was specified by first summing the compound probabilities for the network of S^Fs for that response. This sum was divided into the base rate probability for the R_j. The resulting percentages are listed in column 2.

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Insert Table 2 about here

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The analysis showed that information about "significant" determinants occurring in the immediately prior time interval accounted for a surprising proportion of the base rate information about every one of the R_js. It would seem that, for Denny, much of the information needed to predict his behavior is to be found in a small number of immediately impinging, external social stimuli. The behaviors of other family members set the occasion for much of his obnoxious behaviors.

Behaviors such as Noncomply, Negativism, Whine, and Dependency seemed to be well-defined by the network of significant S^Fs in that three-fourths, or more, of the information in the base rates for those R_js was accounted for.[4]

Reduction in the Number of Stimuli Which are S^Fs

It was hypothesized that changes in rate for the noxious behaviors displayed by Denny would be accompanied by alterations in the density with which controlling stimuli were presented to the child. The stimulus control analysis was carried out separately for baseline, intervention, and follow-up. The number of S^Fs for each noxious response during baseline, intervention, and follow-up for each R_j are presented in Table 3. The summed base rate values for the entire network of S^Fs are also listed for R_j in each condition.

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Insert Table 3 about here

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The data showed that during baseline there were 36 stimuli found significant in controlling the 14 noxious behaviors displayed by Denny. (In many instances the same antecedent stimuli could control a variety of responses.) During intervention only five of the former set of S^Fs continued to control his behavior. During follow-up there were seven. However, during both conditions, some new S^Fs acquired status as controlling stimuli, nine during intervention and two during follow-up. The overall reduction in the number of S^Fs constituted support for the hypothesis that treatment changed the number of S^Fs effective in facilitating Denny's deviant behaviors.

Changes in the frequency with which S^Fs presented: It was possible that even though there were fewer stimuli significant in controlling behavior that those which remained were presented at higher rates. For this reason, the data for stimulus density $p(A_i)$ data in Table 3 were of special interest. It was assumed that following treatment there would be reductions in the frequency with which S^Fs were presented to the problem child when comparing baseline to intervention and follow-up data.

A comparison of the baseline and intervention data showed a reduction in the summed base rate values for the network of stimuli controlling eight of the noxious responses and increases in density for six of the responses. Such shifts during intervention suggested a limited effect during the earlier stages of treatment. The comparison of baseline to follow-up data showed more clearcut improvements in that the densities of controlling stimuli had been reduced for 11 of the responses. The fact that these probabilities had decreased for so many of the noxious responses provided support for the hypothesized impact of family intervention procedures upon densities of controlling stimuli. It should be noted, however, that the fact that these densities remain at what seem to be substantial levels would bespeak a poor prognosis for this family. These data would suggest that treatment was not completed.

Comparing S^Fs found significant during either phase, there was a decrease from baseline to intervention in the conditional probability values $\underline{p}(R_j/A_i)$ in 26 instances; they remained the same, or increased, in 21 (see Appendix A). The comparable values for the follow-up data were 32 and 15. These trends suggest that the majority of the controlling stimuli were losing their "pulling power" in that their occurrence was associated with lowering values for the probability that R_j would occur. In effect, all three analyses of stimulus control were in agreement. There were fewer S^Fs; those which did exist occurred at lower rates and with reduced power. All of them showed that the behavior of family members is less likely to set the occasion for Denny's deviant behaviors.

Changes in Agent Status

The stimuli discussed in the preceding section consisted of behaviors presented by one or more family members. Perhaps certain agents were more likely than others to reinforce some R_js. But for whatever reason, it was hypothesized that the mere "presence" of some agents would be associated with an increased probability of occurrence for each R_j. Each problem behavior might have a different agent or set of agents contributing to its occurrence.

The data were analyzed to determine the contribution of each of the family members as antecedent stimuli for Denny's behavior. These data are summarized in Table 4.

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Insert Table 4 about here

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During baseline, the mother interacted the most with Denny; she served as antecedent for the bulk of his deviant behaviors as well. Her unique status continued throughout the experiment. While efforts were made to teach her to be more contingent, it is clear that the training program had but little

effect upon her status as a controlling stimulus for deviant behavior. She continued to serve as an antecedent for the bulk of Denny's noxious behaviors. These analyses were also in keeping with our clinical impressions to the effect that she changed but little.

The father reduced both his general interaction rates with Denny and eventually the frequency with which he served as either antecedent stimulus or S^F for deviant behaviors. The stimulus control data showed that during treatment he temporarily became involved as a key S^F for much of Denny's noxious behavior. The observers' notes for the period stated that he often served in the role of remedial reading instructor. This shift in role may account for some of this increase in S^F status. However, both he and the mother seemed to be monitoring the sister's initiations to Denny, and his reactions to her, but largely ignoring their own unique contributions to his behavior! A process analysis such as this, if it had been available during intervention, would have emphasized the importance of closer supervision for both mother and father in their own interactions with Denny.

Probably the major impact of the treatment program was reflected in the altered status of the younger sister. While she had previously served as an S^F for the largest number of Denny's noxious behaviors, this was dramatically altered during intervention and follow-up. It is interesting in this regard that as her interactions with Denny presumably became more pleasant she almost doubled her rate of social interaction with him.

Summary

The data showed the parents to be only moderately effective in reducing the rate of deviant child behaviors for their problem child. It had been predicted that their efforts to alter the contingencies maintaining these behaviors would be accompanied by changes in the status of the external stimuli which controlled his noxious responses. The analysis of stimulus control during baseline, intervention, and follow-up supported this hypothesis.

There were changes from baseline through follow-up in the number of social behaviors which served as controlling stimuli for noxious behaviors. As treatment progressed, those stimuli which did significantly control deviant behavior were also presented at lower densities. Presumably, these changes were brought about in large part because of the parents' success in altering the behaviors of the younger sister that had served to facilitate the occurrence of responses from the problem child.

The stimulus control analysis showed that the actual status of the parents, particularly the mother, had really changed but little. The fact that these changes had not occurred suggests that the treatment program was incomplete.

This general set of findings suggests that an analysis of stimulus control may constitute a subtle description of changes in family structure produced by intrusions, such as family intervention programs. Conceivably, such analysis, if carried out during treatment, could serve to identify areas of difficulty which might not be immediately apparent even to the trained clinician.

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Footnotes

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Many of the ideas presented here were developed as a result of extended discussions about stimulus control with R. Ziller, H. Hops, J. Cobb, R. Jones, and J. Reid. The writer is particularly grateful to R. Jones for his critical response to an earlier version of this manuscript.

2. As pointed out by R. Ryder, the fact that the events within code classes may not be independent would violate one of the fundamental assumptions underlying the use of the chi-square statistic. This, in turn, would pose a major problem in the interpretation of the statistic. Currently we are testing the validity of the independence assumption by carrying out auto-correlational analyses for each code category.

3. The data in the current analysis were provided by only a single target subject and used both chained and unchained interactions (see Patterson & Cobb, 1972b for definitions of these terms). One might expect that there would be little relation between findings obtained in the present analysis as compared to that previously obtained when using 55 problem boys and only those data from "unchained" interaction. The stimulus networks obtained in the two analyses were compared to determine whether some similarities did in fact exist. The data showed that for the 13 noxious responses common to both analyses, at least half of the facilitating stimuli were the same behavioral events for eight of the variables. This suggests some modest generalizability of the earlier across-subjects findings for networks of controlling stimuli.

4. In the across-subjects analyses reported earlier (Patterson & Cobb, 1972b) there was a nonsignificant correlation of .49 ($p < .10$) between

$\underline{p}(R_j)$ and the proportion of the R_j accounted for by the significant S^Fs. The comparable correlation for the present data was .17 (n.s.). These findings suggest that stimulus control response definitions were only partially related to the adequacy of the sampling of response events and perhaps more related to the appropriateness of the variables being sampled as determinants.

5. There was an across-response correlation of +.27 (n.s.) between $\underline{p}(R_j)$ and the summed $\underline{p}(A_i)$ for each of the 14 R_js during baseline. Evidently, the density of controlling stimuli is only partially responsible for determining the relative rate of occurrence for an R_j.

Table 1

Changes in Denny's Behavior during Intervention and Follow-up

Conditions	Mean occurrence of referral symptoms per day	Observation Variables													Total	Mean
		CN	CR	DI	DP	DS*	HR	HU	IG	NC*	NE*	PN*	TE*	WH	YE*		
Baseline	69%	.0044	.0708	.0164	.0035	.0453	.0039	.0326	.0245	.0019	.0123	.0007	.0030	.0030	.0243	.2466	.0176
Intervention	50%	.0019	.0549	.0050	-0-	.0474	.0050	.0343	.0237	-0-	.0075	.0006	.0025	.0056	.0131	.2015	.0144
Follow-up	50%	.0012	.0213	.0047	.0012	.0498	.0095	.0201	.0095	.0012	-0-	-0-	-0-	.0083	.0071	.1342	.0096

*Behaviors targeted by parents during training

Table 2

Stimulus Control Networks for Denny's Noxious Responses

Noxious Responses	Number of Significant SFs	Percent of $\underline{p}(R_j)$ Accounted for by Summed Compound Probabilities
Command Negative	4	40.6
Cry	4	56.6
Disapproval	4	67.4
Dependency	2	74.8
Destructive	1	70.4
High Rate	2	50.9
Humiliate	2	46.8
Ignore	1	66.7
Noncomply	2	98.0
Negativism	2	84.8
Physical Negative	3	58.9
Tease	1	54.0
Whine	5	88.0
Yell	3	55.3

Table 3

Changes in Density of Controlling Stimuli

	$\Sigma\, p(A_i)$ Baseline	Number of S^Fs	$\Sigma\, p(A_i)$ Intervention	Number of S^Fs Old (Baseline)	New	$\Sigma\, p(A_i)$ Follow-up	Number of S^Fs Old (Baseline)	New
CN	.0716	4	.0589	0	0	.0294	0	0
CR	.2781	4	.2355	0	0	.2333	2	0
DI	.3939	4	.4552	0	3	.3304	1	0
DP	.3829	2	.4483	0	0	.3115	0	0
DS	.1885	1	.1174	0	0	.1327	0	0
HR	.1905	2	.1174	1	0	.1338	0	0
HU	.0507	2	.0444	0	0	.0260	0	0
IG	.0488	1	.0444	1	0	.0260	0	0
NC	.1032	2	.1268	2	0	.1006	2	0
NE	.3350	2	.4039	0	0	.2855	0	0
PN	.1261	3	.0956	0	2	.2949	0	1
TE	.1185	1	.1174	1	3	.1327	1	0
WH	.5103	5	.5707	0	0	.4501	1	0
YE	.3469	3	.4134	0	1	.2937	0	1
	Total	36		5	9		7	2

Table 4

Changes in Agent Status

Experimental Condition	Denny's Behavior	Proportion Denny's Behaviors for which Agent was Antecedent			Number of Denny's Deviant Behaviors for which Agents were S^F			
		Father	Mother	Sister	Father	Mother	Sister	Total
Baseline	Deviant Behavior	31.2	46.4	22.3	2	4	6	12
	Total Interaction	31.2	44.8	24.0				
Intervention	Deviant Behavior	42.1	44.3	13.6	5	2	1	8
	Total Interaction	26.2	41.9	31.9				
Follow-up	Deviant Behavior	19.5	56.6	23.9	1	3	1	5
	Total Interaction	11.6	42.5	45.9				

APPENDIX A

NETWORKS OF CONTROLLING STIMULI FOR NOXIOUS RESPONSES
DURING BASELINE, INTERVENTION, AND FOLLOW-UP

Antecedent Event	Baseline $p(A_i)$	Baseline $p(R_j/A_i)$	Baseline $[p(A_i)][p(R_j/A_i)]$	Intervention $p(A_i)$	Intervention $p(R_j/A_i)$	Intervention $[p(A_i)][p(R_j/A_i)]$	Follow-up $p(A_i)$	Follow-up $p(R_j/A_i)$	Follow-up $[p(A_i)][p(R_j/A_i)]$
Command Negative p(PN) .00439									
Compliance	.00971	.0476*	.00046	.0082	.0000	.0000	.0023	.0000	.0000
Cry	.00115	.2000*	.00023	.0000	.0000	.0000	-0-	.0000	.0000
Disapproval	.04880	.0190*	.00093	.0044	.0141	.00062	.0260	.0000	.0000
Noncomply	.01179	.1373*	.00162	.0063	.0000	.0000	.0011	.0000	.0000
Sister's presence		.0106*							
Cry p(CR) .02452									
Attend	.18852	.0552*	.01041	.1174	.0745	.00874	.1327	.0000	.0000
Command Negative	.02059	.0674*	.00139	.1149	.1053	.00125	.0817	.0145	.00119
Physical Negative	.00300	.3077*	.00093	.0013	.0000	.0000	.0059	.2000*	.00119
Tease	.00393	.2941*	.00116	.0019	.0000	.0000	.0130	.2727*	.00356
Father's presence		.0481*							
Disapproval p(DI) .07078									
Disapproval	.04880	.1848*	.00902	.0444	.1690	.00749	.0260	.0455	.00119
Ignore	.00693	.1667*	.001157	.0050	.1250	.00062	.0059	.0000	.0000
Talk	.33402	.1080*	.036086	.4039	.0587	.02372	.2855	.0456*	.01303
Tease	.00393	.2353*	.00093	.0019	.0000	.0000	.0130	.0000	.0000
Attend	.18852	.0712	.01342	.1174	.0957*	.01124	.1327	.0179	.002370
Comply	.00971	.0952	.00093	.0082	.3846*	.00312	.0023	.0000	.0000
Whine	.00046	.0000	.0000	.0007	1.0000*	.00062	-0-	.0000	.0000
Mother's presence		.0723*							
Sister's presence		.0724*							

APPENDIX A (CON'T.)

Antecedent Event	Baseline $p(A_i)$	Baseline $p(R_j/A_i)$	Baseline $[p(A_i)][p(R_j/A_i)]$	Intervention $p(A_i)$	Intervention $p(R_j/A_i)$	Intervention $[p(A_i)][p(R_j/A_i)]$	Follow-up $p(A_i)$	Follow-up $p(R_j/A_i)$	Follow-up $[p(A_i)][p(R_j/A_i)]$
Dependency p(DP) .00185									
Disapproval	.04880	.0095*	.00046	.0444	-0-	.0000	.0260	.0000	
Talk	.33402	.0028*	.00093	.4039	.0000	.0000	.2655	.0041	.00119
Mother's presence		.0031*							
Destructiveness p(DS) .01642									
Attend	.18852	.0613*	.01157	.1174	.0213	.0025	.1327	.0089	.00119
Sister's presence		.0512*							
High Rate p(HR) .01226									
Attend	.18852	.0258*	.00486	.1174	.0213*	.00249	.1327	.0000	.0000
High Rate	.00185	.7500*	.00139	.0000	.0000	.0000	.0011	.0000	.0000
Receive	.00092	.0000	.0000	.0019	.3333*	.00062	.0011	.0000	.0000
Sister's presence		.0280*							
Humiliate p(HU) .00346									
Disapproval	.04880	.0284*	.00138	.0444	-0-	.0000	.0260	.0000	.0000
Humiliate	.00185	.1250*	.00023	.0000	.0000	.0000	.0000	.0000	.0000
Sister's presence		.0106*							
Ignore p(IG) .00069									
Disapproval	.04880	.0095*	.00046	.0444	.0141*	.00062	.0260	-0-	.0000
Father's presence		.0015*							
Noncomply p(NC) .04533									
Command	.08252	.4482*	.037011	.1149	.3696*	.04245	.0817	.5362*	.04384
Command Negative	.02059	.3596*	.0074	.0119	.4211*	.00499	.0189	.3125*	.00592
Mother's presence		.0671*							

Antecedent Event	Baseline $p(A_i)$	Baseline $p(R_j/A_i)$	Baseline $[p(A_i)][p(R_j/A_i)]$	Intervention $p(A_i)$	Intervention $p(R_j/A_i)$	Intervention $[p(A_i)][p(R_j/A_i)]$	Follow-up $p(A_i)$	Follow-up $p(R_j/A_i)$	Follow-up $[p(A_i)][p(R_j/A_i)]$
Negativism p(NE) .0030									
Negativism	.00092	.2500*	.00023	.0000	.0000	.0000	.0000	-0-	.0000
Talk	.33402	.0069*	.00231	.4039	.0031	.00125	.2855	-0-	.0000
Mother's presence		.0067*							
Physical Negative p(PN) .00393									
Cry	.00115	.2000*	.00023	.0000	.0000	.0000	.0000	-0-	.0000
Disapproval	.04880	.0237*	.00116	.0444	.0141	.00062	.0260	.0000	.0000
Play	.07610	.0122*	.00093	.0512	.0000	.0000	.2689	.0088	.00237
Attend	.18852	.0049	.00093	.1174	.0213*	.0025	.1327	.0268	.00356
Laugh	.0030	.0000	.0000	.0038	.1667*	.00062	.0047	.0000	.0000
Yell	.00162	.0000	.0000	.0019	.0000	.0000	.0023	.5000*	.00119
Sister's presence		.0116*							
Tease p(TE) .0030									
Attend	.18852	.0086*	.00162	.1174	.0106	.00125	.1327	.0268*	.00356
Disapprove	.04880	.0047	.00023	.0444	.0282*	.00125	.0260	.0455	.00119
Noncomply	.01179	.0000	.0000	.0063	.1000*	.00062	.0011	.0000	.0000
Sister's presence		.0068*							
Whine p(WH) .03161									
Attend	.18852	.0552*	.01041	.1174	.0266	.00312	.1327	.0179	.00237
Disapproval	.04880	.0806*	.00393	.0444	.1127	.00499	.0260	.0909	.00237
Humiliate	.00185	.1250*	.00023	.0000	-0-	.0000	.0000	-0-	.0000
Ignore	.00693	.1333*	.00093	.0050	.0000	.0000	.0059	.0000	.0000
Talk	.33402	.0395*	.01319	.4039	.0526	.02122	.2855	.0415*	.01185
Father's presence		.0430*							
Mother's presence		.0418*							

Antecedent Event	Baseline $p(A_i)$	Baseline $p(R_j/A_i)$	Baseline $[p(A_i)][p(R_j/A_i)]$	Intervention $p(A_i)$	Intervention $p(R_j/A_i)$	Intervention $[p(A_i)][p(R_j/A_i)]$	Follow-up $p(A_i)$	Follow-up $p(R_j/A_i)$	Follow-up $[p(A_i)][p(R_j/A_i)]$
		Yell p(YE) .02428							
Comply	.00971	.1190*	.00116	.0082	.0769	.000624	.0023	.0000	.0000
Physical Negative	.00300	.1538*	.00046	.0013	.5000	.000624	.0059	.0000	.0000
Talk	.33402	.0353*	.01180	.4039	.0170	.00687	.2855	.0041	.00119
Tease	.00393	.0588	.00023	.0019	.3333*	.000624	.0130	.0909	.00119
Physical positive	.00879	.0000	.0000	.0113	.0000	.0000	.0071	.1667*	.00119
Mother's presence		.0294*							